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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/066,169	01/30/2002	Niklas Bondestam	ASMMC.034AUS	2704

20995 7590 07/27/2005

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EXAMINER

SODERQUIST, ARLEN

ART UNIT PAPER NUMBER

1743

DATE MAILED: 07/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/066,169

Applicant(s)

BONDESTAM ET AL.

Examiner

Arlen Soderquist

Art Unit

1743

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 May 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-35 and 37-43 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-34 is/are allowed.
- 6) ☒ Claim(s) 35 and 37-43 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 June 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

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1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 4, 2005 has been entered.

2. Claims 35 and 37-43 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is not clear what the relationship between the first cycle and the second cycle is that allows a change in the amount of reaction to be determined. For example the applied Min reference has two different reagents that are monitored. A first cycle could be for the first reagent and a second cycle could be for the second reagent. Additionally how are the two cycles related in time? Are they right after one another or are they separated by a time that allows for the possibility of a difference being seen? Additionally it is not clear what change is being determined. Also it is not clear if the pressure is monitored by a sensor connected directly to the reactant source conduit or if the pressure can be monitored in the manner that the Chowdhury reference monitors the process. Finally there is no determination step or tying of the comparison step to a determination. For examination purposes this set of claims will be treated as an indirect method of monitoring concentration is still within the claim scope.

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

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4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 35 and 37-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Min in view of Chowdhury and Schmitt (US 6,038,919). In the paper Min teaches atomic layer deposition of TiN films by alternate supply of tetrakis(ethylmethylamino)titanium and ammonia. Atomic layer deposition (ALD) of amorphous TiN films on SiO₂ between 170° and 210° was studied by alternate supply of reactant sources, Ti[N(C₂H₅CH₃)₂]₄ [tetrakis(ethylmethylamino)titanium: TEMAT] and NH₃. Reactant sources were injected into the reactor in the following order: TEMAT vapor pulse, Ar gas pulse, NH₃ gas pulse and Ar gas pulse. Film thickness per cycle was saturated at ~1.6 monolayers (ML) per cycle with sufficient pulse times of reactant sources at 200°. Probably film thickness per cycle could exceed 1 ML/cycle in ALD, and are explained by chemisorption mechanism of the reactant sources. An ideal linear relation between the number of cycles and film thickness was confirmed. As a result of surface limited reactions of ALD, step coverage was excellent. Particles caused by the gas phase reactions between TEMAT and NH₃ were almost absent because TEMAT was segregated from NH₃ by the Ar pulse. In spite of relatively low substrate temperature, C impurity was incorporated <4 atom%. Figure 1 shows the apparatus including the solid TEMAT source and the computer controlled valves. Min does not teach sensors to monitor the reactant pulses.

In the paper Chowdhury teaches real-time process sensing and metrology in amorphous and selective area silicon plasma enhanced chemical vapor deposition using in-situ mass spectrometry. The authors have used mass spectroscopy to observe and analyze, in real-time, gas phase reactants and product species in plasma-enhanced CVD deposition (PECVD) of silicon. They describe a doubly differentially pumped mass spectrometry system to sample the exhaust stream of a large-area plasma CVD reactor operating at 0.4-1.5 torr. They show real-time quantitative analysis of silane consumption and hydrogen production for deposition of hydrogenated amorphous silicon and for pulsed-gas selective area silicon deposition (see figures 8-9 and their associated discussion). The ability of mass spectrometry to observe process faults in real time is also demonstrated (see figure 7 for example). Mass spectroscopy is a useful nonintrusive process-state sensor for real-time metrology of plasma deposition, for example, to quantify gas phase species, and to characterize reactions occurring on the substrate surface.

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Based on their results, the authors discuss potential advanced manufacturing applications of real-time mass spectrometry in amorphous silicon and selective area silicon plasma deposition, including indirect wafer-state sensing, fault analysis and classification, and run-to-run and real-time process control (see the discussion and conclusions section on pages 131-132). This section in particular teaches that the ability to analyze and detect problems in real-time could assist in the use of pulsed gas selective deposition techniques on a large scale in manufacturing processes.

In the patent Schmitt teaches a method and system for determining the quantity of processing substance in a storage space for a process and apparatus that delivers a processing substance from a storage vessel to a processing station, the storage vessel enclosing the processing substance in a storage space and being coupled to conduits which communicate with the storage space. The storage vessel and the conduits enclose a volume which includes the storage space. In the method and system the quantity of processing substance in the storage space is determined by closing the volume enclosed by the storage vessel and the conduits; performing first and second pressure measurements for measuring the gas pressure in the volume when the volume contains respectively first and second quantities of gas; determining the difference between the first and second quantities of gas; and calculating the quantity of processing substance in the storage space on the basis of the volume, the difference between the first and second quantities of gas and the gas pressures measured during the first and second pressure measurements.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate a sensor as taught by Chowdhury or Schmitt into the device and method of Min because of the ability to monitor the process in real time and thereby adjust for problems in the operation of the device as taught by Chowdhury and the use of sensor to measure reactant pressure in a system as taught by Schmitt.

5. Claims 1-34 are allowed. The art of record fails to teach or fairly suggest the combination of method steps and apparatus elements as claimed.

6. Applicant's arguments filed May 4, 2005 have been fully considered but they are not persuasive. An examination of the claims has resulted in the allowance of most of the claims and brought to light new clarity problems with the remaining claims as enumerated above. Relative to the art examiner notes that it is the Min reference that is being modified by examiner. Thus

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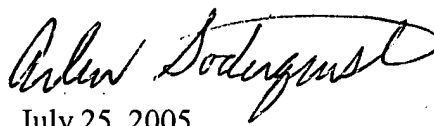
the comments directed to modification of Schmitt with Chowdhury are not directed at the combination of references used by examiner and therefore not persuasive.

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The additionally cited art relates to pulsed reactors of various types.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arlen Soderquist whose telephone number is (571) 272-1265. The examiner's schedule is variable between the hours of about 6:30 AM to about 5:00 PM on Monday through Thursday and alternate Fridays.

A general phone number for the organization to which this application is assigned is (571) 272-1700. The fax phone number to file official papers for this application or proceeding is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



July 25, 2005

ARLEN SODERQUIST
PRIMARY EXAMINER